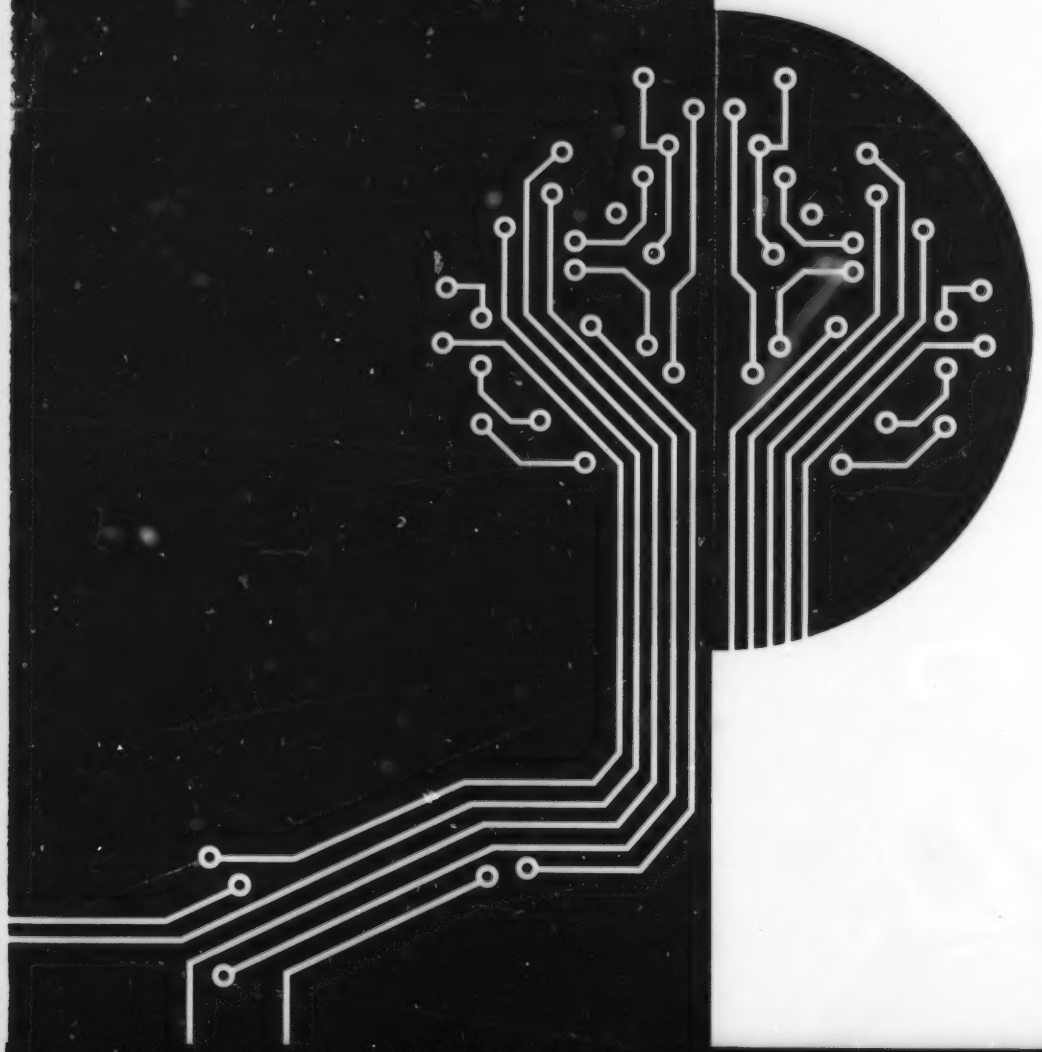
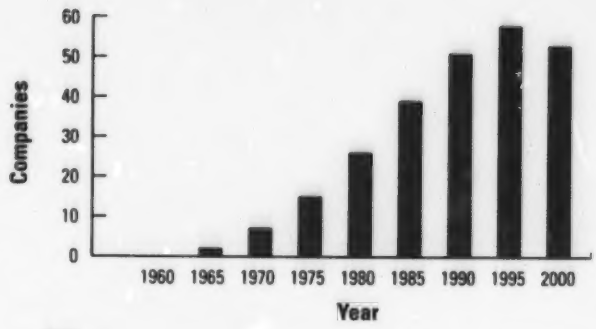
A Family Tree of the Communications Research Centre

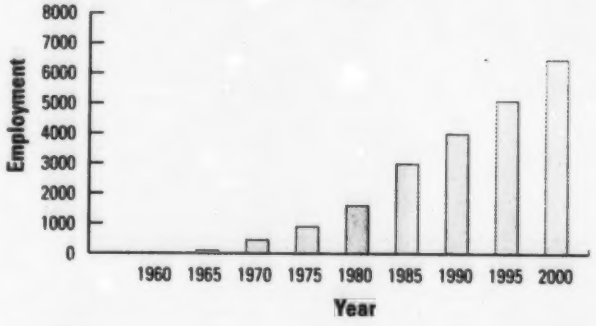


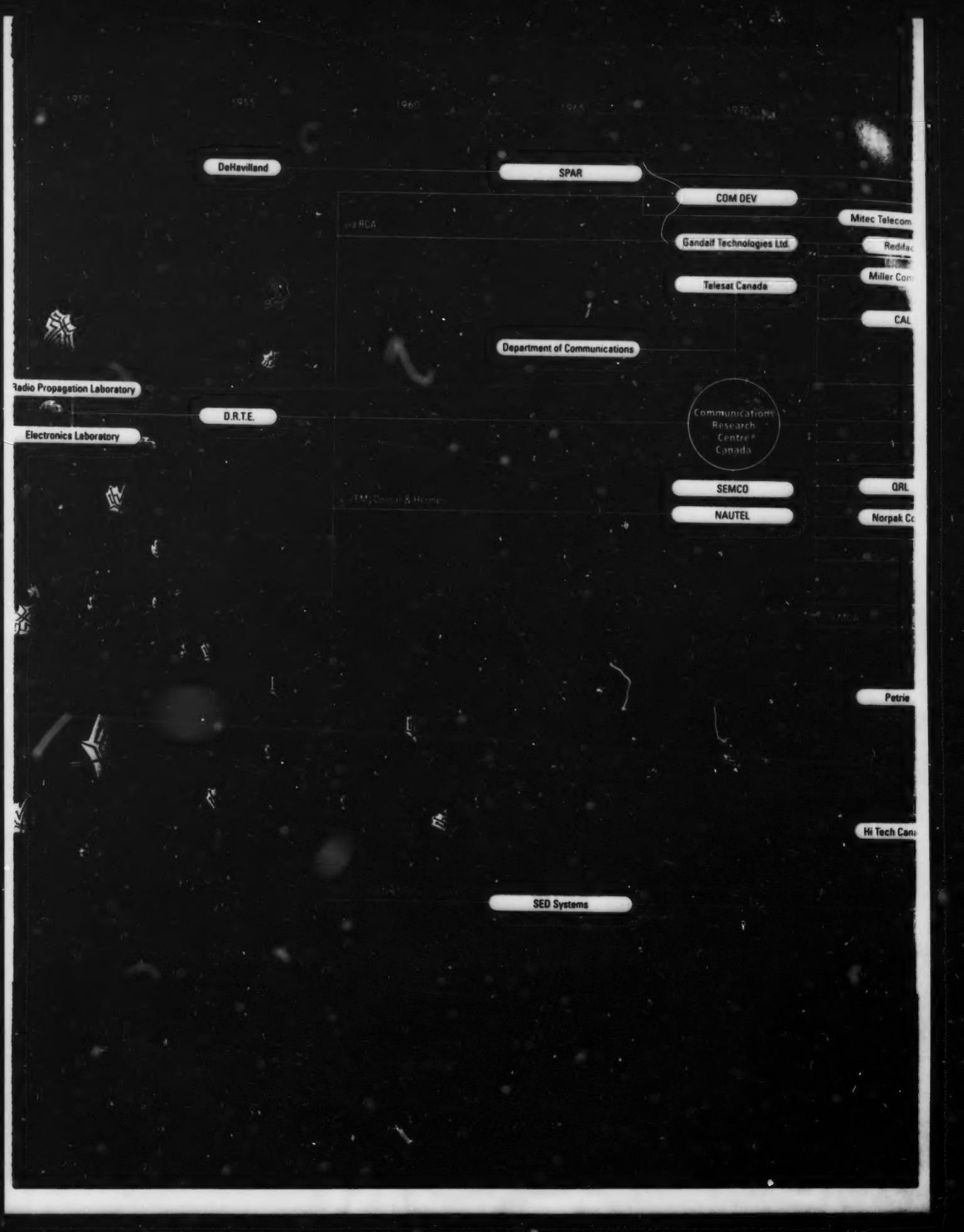
CRC

This chart shows the genealogy of high technology companies that had their principal origins in the Communications Research Centre or its predecessor, the Defence Research Telecommunications Establishment (DRTE).
The branches on the tree refer to the sources of either their technology or their key people.
The main criterion for source identification is based on the premise that the company would not have been involved at that particular point in time.
It includes only new companies that were started as a result of CRC or DRTE involvement as well as spin-offs from those companies. There are many other companies that have received technology and technical assistance from CRC and DRTE, but they are not included here unless such interaction resulted in the formation of new companies.

SPAR Ltd. was involved in the Canadian space program while it was still the Special Projects and Applied Research Division of DeHavilland.
It supplied the antenna system for Canada's first satellite, Alouette I in 1962. It became a separate company in 1967 and became CRC's major supplier of space technology after RCA Canada withdrew from the field in the mid-seventies.
At the same time, other companies such as COM DEV and MPB Technologies spun out of RCA.






1950
1955
1960
1965
1970
DeHavilland
SPAR
COM DEV
Mitec Telecom
via RCA
Gandalf Technologies Ltd.
Telesat Canada
Department of Communications
Radio Propagation Laboratory
D.R.T.E.
Electronics Laboratory
Communications Research Centre Canada
SEMCO
NAUTEL
QRL
Petrie
Hi Tech Can
SED Systems

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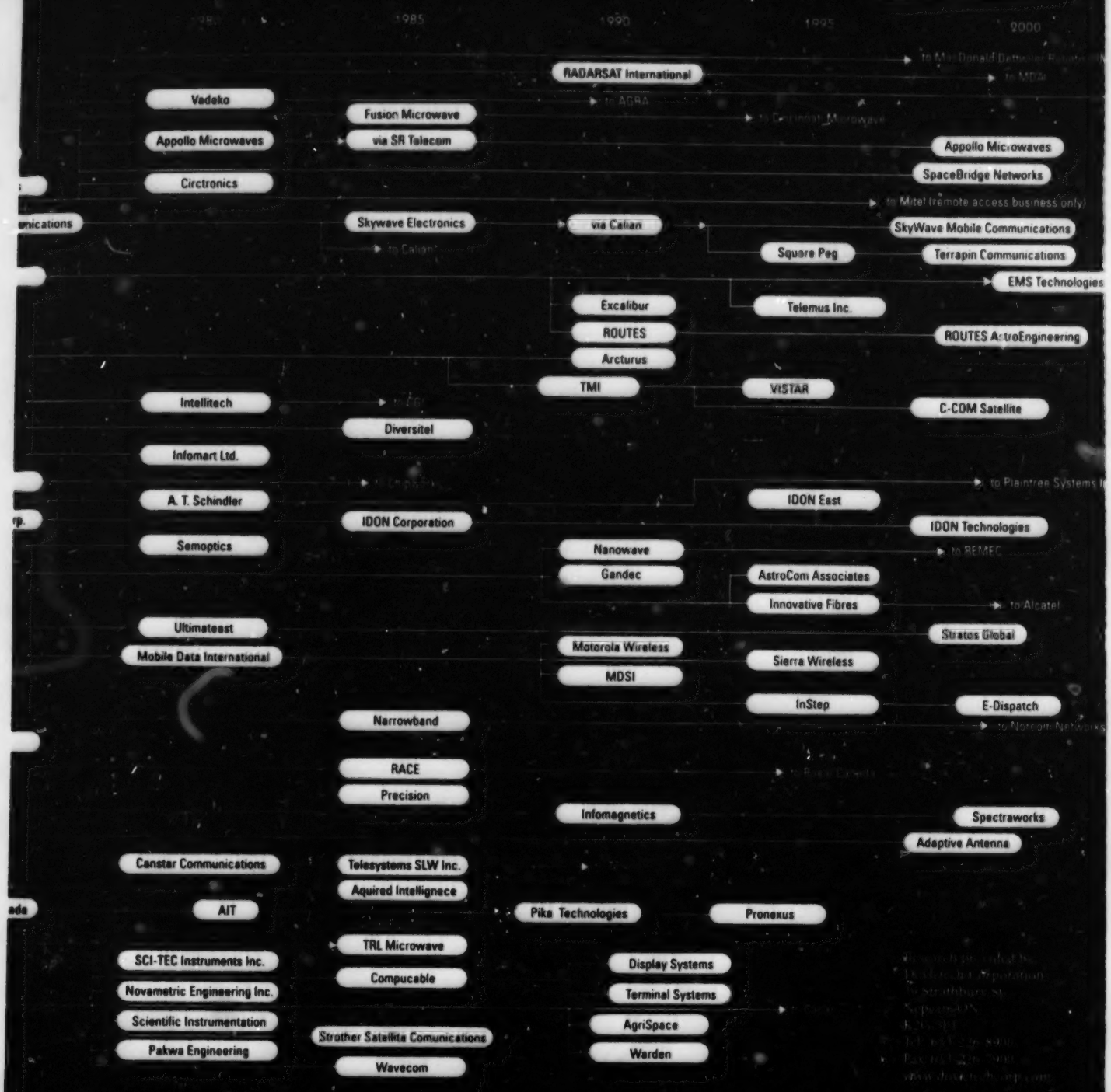
1985
1990
1995
2000
RADARSAT International
to MacDonald Dettwiler
to MDA
Vadeko
Fusion Microwave
to AGRA
Appollo Microwaves
via SR Telecom
to Terrestar Microwave
Appollo Microwaves
Circtronics
SpaceBridge Networks
to Mitel (remote access business only)
Skywave Electronics
via Calian
SkyWave Mobile Communications
to Calian
Square Peg
Terrapin Communications
EMS Technologies
Excalibur
Telemus Inc.
ROUTES
ROUTES AstroEngineering
Arcturus
TMI
VISTAR
Intellitech
C-COM Satellite
Diversitel
Infomart Ltd.
to Plaintree Systems
A. T. Schindler
IDON East
IDON Corporation
IDON Technologies
Semoptics
Nanowave
to REMEC
Gandec
AstroCom Associates
Innovative Fibres
to Alcatel
Ultimateast
Stratos Global
Motorola Wireless
Mobile Data International
Sierra Wireless
MDSI
InStep
E-Dispatch
to Norcom Networks
Narrowband
RACE
Precision
Infomagnetics
Spectraworks
Adaptive Antenna
Canstar Communications
Telesystems SLW Inc.
Aquired Intelligence
AIT
Pika Technologies
Pronexus
TRL Microwave
SCI-TEC Instruments Inc.
Compucable
Display Systems
Novametric Engineering Inc.
Terminal Systems
Scientific Instrumentation
AgriSpace
Strother Satellite Comunications
Pakwa Engineering
Warden
Wavecom

Acquired Intelligence Inc.
Victoria, British Columbia
• 8 Employees
Offers products and services in the area of expert systems related to knowledge acquisition and similar applications.

Adaptive Antenna
Ottawa, Ontario • 2 Employees
Provides consulting services in the area of smart antennas and related fields.

AgriSpace Technologies Inc.
Saskatoon, Saskatchewan • 3 Employees
Supplies engineering support services related to instrumentation and data acquisition systems.

AIT Advanced Information Technologies Corp.
Ottawa, Ontario • 80 Employees
Software-based systems for machine-readable travel documents and services for security and military applications.

Appollo Microwaves Ltd.
Montreal, Quebec • 126 Employees
Designs and manufactures satellite and wireless terrestrial communciations systems. The firm was sold to SR Telecom in 1986 but was bought back in 1999.

Arcturus Engineering Inc.
Russell, Ontario • 3 Employees
Telecommunications engineering firm that specializes in systems integration and project management.

AstroCom Associates Inc.
Ottawa, Ontario • 15 Employees
Provides consulting services in a broad range of satellite and communciations technologies.

A.T. Schindler Communications Inc.
Ottawa, Ontario
Designs, manufactures and markets wireless ethernet and token ring transceivers for use in wireless LANs, intra-building and inter-building, applications. Purchased by Plaintree Systems Inc. March 2000.

Canadian Astronautics Ltd. (CAL)
Ottawa, Ontario
Formed in the early seventies, this company supplied mobile satellite communications systems and space systems. It merged with Electromagnetic Sciences of Atlanta in 1994. It became EMS Technologies in 1998 and this firm acquired SPAR's Montreal operations (see EMS Technologies).

Canstar Communications
Toronto, Ontario
Formed in the sixties as a subsidiary of Canada Wire and Cable to pursue both wireless and land-based communciations opportunities.

C-COM Satellite Systems Inc.
Ottawa, Ontario • 8 Employees
Develops and implements remote mobile and fixed site wireless data system products.

Circtronics
Nepean, Ontario
Provided prototype and production services for the manufacture of printed circuit boards.

COM DEV International Ltd.
Cambridge, Ontario • 600 Employees
Evolved out of RCA's Canadian R&D and production facilities which were set up to address the Canadian space requirements in the early sixties. Specializes in microwave and millimetre wave RF subsystems for space applications and a broad range of communications technologies.

Compucable Inc.
Saskatoon, Saskatchewan
This company was formed in 1983 to supply teletext systems for cable television applications. It was later broken into two companies, Display Systems International Inc. and Terminal Systems International Inc.

Display Systems International Inc.
Saskatoon, Saskatchewan • 8 Employees
Designs and markets digital display systems for use in a wide variety of markets, particularly retail outlets.

Diversitel Communications Inc.
Nepean, Ontario • 4 Employees
Designs and manufactures specialized wireless communications systems.

E-Dispatch Inc.
Vancouver, British Columbia
• 29 Employees
Supplies software-based dispatch and communications systems for mobile applications.

EMS Technologies Inc.
Ottawa, Ontario and
Montreal, Quebec • 850 Employees
A subsidiary of Electromagnetic Sciences of Atlanta, Georgia, this company evolved out of CAL Corporation and took over SPAR's Montreal operations in 1998. It supplies a broad range of space-related products and services.

Excalibur Systems Ltd.
Kanata, Ontario • 26 Employees
Produces simulation and training products for defence industry.

Fusion Microwave Ltd.
Toronto, Ontario
Designed and distributed high performance microwave components. Merged with Cincinnati Microwave.

Gandalf Technologies Ltd.
Nepean, Ontario
This company was formed in 1970 as a result of some modem technology that was developed at CRC. Its remote access business merged with Mitel in 1977.

Gandec Systems Inc.
Nepean, Ontario • 1 Employee
Developed a wideband microstrip patch array antenna for use in PCS applications.

Hi Tech Canada
Ottawa, Ontario
Formed in the late sixties to provide consulting services to Communications Technology Satellite (CTS) program at CRC.

IDON Corporation
Ottawa, Ontario • 2 Employees
Specializes in R&D and consulting in informatics and geomatics in the areas of communications coding systems and services, national and international standards development, and electronic courseware.

IDON Technologies Inc.
Ottawa, Ontario • 1 Employee
Specializes in information technology coding standards.

IDON East Corporation
St. John's, Newfoundland • 13 Employees
Supplies systems and services for IT distance education and training.

Infomagnetics Technologies Corporation
Winnipeg, Manitoba • 45 Employees
Designs and manufactures antennas and systems related to the application of electromagnetic technologies.

Infomart Ltd.
Toronto, Ontario
Formed in the late seventies as a joint venture between various newspapers and communications companies to pursue teletext and videotext technologies that had been developed at CRC.

Innovative Fibres Inc.
Gatineau, Quebec
Designed and supplied optical systems based on fibre grating technology. Sold to Alcatel.

InStep Mobile Communications Inc.
Vancouver, British Columbia
Name changed to E-Dispatch Inc. (See E-Dispatch Inc.).

Intellitech Canada Ltd.
Ottawa, Ontario
A data communications consulting firm. Employment was 25 when merged with CGI.

Miller Communications Systems Ltd.
Kanata, Ontario
Formed in the early seventies to provide communications systems based on technology that had been developed at CRC and Telesat Canada.

Mitec Telecom Inc.
Pointe Claire, Quebec • 250 Employees
Designs and manufactures telecommunications components and subsystems for sale to large original equipment manufactures for incorporation into wireless infrastructure equipment.

Mobile Data International
Richmond, British Columbia
Formed in 1978 to commercialize communications technology that had been developed at CRC and licensed to MacDonald, Dettwiler & Associates. Purchased by Motorola in the late eighties (see Motorola Wireless).

Mobile Data Solutions Inc. (MDSI)
Richmond, British Columbia •
250 Employees
Provides applications software for computer-aided dispatching in mobile communications systems.

Motorola Wireless
Richmond, British Columbia
• 250 Employees
Supplies data communications products based on wireless technologies.

Nanowave
Etobicoke, Ontario
See REMEC Nanwave.

Narrowband Telecommunications Research
Burnaby, British Columbia
• 20 Employees
Designs and distributes mobile satellite communications terminals. Acquired by Norcom Networks of Virginia in 1999.

NAUTEL Limited
Hackett's Cove, Nova Scotia
• 120 Employees
Designs and manufactures AM and FM communications equipment.

Norpak Corporation
Kanata, Ontario • 26 Employees
Designs and manufactures VBI data broadcast systems. Products include data inserters, bridges, PC card/set top receivers, as well as custom applications software.

Novametrics
Saskatoon, Saskatchewan • 2 Employees
Spun out of SED Systems in the early eighties to supply consulting services to utilities and government agencies.

Pakwa Engineering
Saskatoon, Saskatchewan
Consulting firm that specialized in strategic management and technology commercialization.

Petrie Telecommunications Ltd.
Nepean, Ontario • 5 Employees
Designs radio communications systems and offers related consulting services. Also distributes software for propagation prediction.

Pika Technologies Inc.
Kanata, Ontario • 40 Employees
Manufacturer of computer telephony equipment with voice response and speech/pulse recognition platforms.

Precision Photomasque Inc.
Montreal, Quebec
Produced photomasks for integrated circuits and printed circuit boards.

Proxenus Inc.
Kanata, Ontario • 26 Employees
Provides computer telephony development software for client/server architectures.

QRL Ltd.
Ottawa, Ontario
Spun out of CRC in the mid seventies to provide high reliability electronics systems and analysis services to CRC. Merged with Chipworks.

RACE Technology
Vancouver, British Columbia
Designed and manufactured HF communications products and systems. Became part of RACAL Canada in 1994.

RADARSAT International
Richmond, British Columbia
• 85 Employees
Distributes synthetic aperture radar data from Canada's Radarsat satellite. In addition to its exclusive worldwide distribution of Radarsat data products. RSI distributes ERS data products in North America and Landsat, SPOT and JERS-1 data products in Canada. Merged with MDA.

Redifacts Ltd.
Nepean, Ontario
Founded in the early eighties to supply real time data acquisition and communications systems. Merged with Gandalf in the late eighties.

REMEC Nanowave
Etobicoke, Ontario • 122 Employees
Designs and supplies a broad range of solid state amplifiers and complementary products such as mixers, converters, and microwave transmit/receive systems. Acquired by REMEC from California in 1997 (division now called REMEC Nanowave).

ROUTES AstroEngineering Inc.
Kanata, Ontario • 22 Employees
Designs and builds scientific instruments and other equipment for space and terrestrial applications. Also provides engineering consulting, systems studies and related services.

ROUTES Incorporated
Kanata, Ontario
Name changed to ROUTES AstroEngineering Inc.
(see ROUTES AstroEngineering Inc.)

Scientific Instrumentation Ltd.
Saskatoon, Saskatchewan
• 15 Employees
Spun out of SED in the late seventies to supply data acquisition and communications systems to the resource industries, the utilities, and defence applications.

SCI-TEC Instruments Inc.
Saskatoon, Saskatchewan
• 100 Employees
Spun out of SED in 1981 to supply instrumentation for the oil industry and for measuring various chemicals in the upper atmosphere.

SED Systems, a division of Callan Ltd.
Saskatoon, Saskatchewan
• 280 Employees
Origins can be traced to the late fifties when the University of Saskatchewan was asked to participate in HF communications research with DRTE. Current activities are focussed on hardware and software systems for satellite communications.

Semco Ltd.
Nepean, Ontario
Formed in the late sixties to develop a scanning electron microscope for use in Canada's space program. Merged with a multi-national company in the late seventies.

Semoptics Ltd.
Nepean, Ontario • 2 Employees
Supplies high intensity electron sources and services scanning electron microscopes.

Sierra Wireless Inc.
Richmond, British Columbia
• 150 Employees
Designs, manufactures and distributes a broad range of wireless data modems and enabling software for use with hand-held computing and communications devices.

Skywave Electronics Ltd.
Kanata, Ontario
Formed in mid eighties to produce systems for processing voice and data signals for transmission over radio satellite communication links.

SkyWave Mobile Communications Inc.
Ottawa, Ontario • 14 Employees
Designs mobile satellite communications terminals, voice compression products.

SpaceBridge Networks Corp.
Hull, Quebec • 100 Employees
Develops products for broadband wireless communications systems.

SPAR Aerospace Ltd.
Toronto, Ontario
Formed in the early sixties out of the Special Projects and Applied Research (SPAR) division of DeHavilland Aircraft. Its entry into the space industry was facilitated by its purchase of the RCA facility in Montreal that had received its early space technology from CRC. A portion of this company merged with MacDonald Dettwiler and Associates Ltd. and another with EMS Technologies Canada.

Spectraworks Inc.
Winnipeg, Manitoba • 24 Employees
Provides telecommunications equipment for hybrid satellite-terrestrial wireless applications.

Square Peg Communications Inc.
Kanata, Ontario • 9 Employees
This company was spun out of Calian in 1995. Manufactures ground and air-borne communications products from audio to L-band.

Stratos Global Corp.
St. John's, Newfoundland
• 250 Employees
Founded as Ultimateast in 1980, the firm commercialized a HF modem in the early eighties for providing data communications to ships, aircraft and small planes. Today, Stratos is a publicly-traded company specializing in multi-network mobile satellite services.

Strother Satellite Communications
Saskatoon, Saskatchewan
Designed and manufactured satellite antenna systems for industrial and consumer applications.

Telemus Inc.
Kanata, Ontario • 30 Employees
Supplies products and services for electronic counter measures (EMC) and surveillance.

Telesat Canada
Gloucester, Ontario • 487 Employees
A national communications common carrier providing telecommunications and broadcast distribution services throughout Canada and into the United States via its fifth generation Anik E satellites.

Telesystems SLW Inc.
Toronto, Ontario
Formed in the early eighties to commercialize spread spectrum technology.

Terminal Systems International
Saskatoon, Saskatchewan • 5 Employees
Designs and markets electronic display systems for use in the transportation industry.

Terrapin Communications Inc.
Kanata, Ontario • 3 Employees
Develops and manufactures wireless alerting devices for the consumer and industrial markets.

TMI Communications
Gloucester, Ontario • 85 Employees
Provides products and services for mobile satellite communications systems.

TRL Microwave Technology Inc.
Burnaby, British Columbia
• 8 Employees
Develops and manufactures microwave and millimeterwave products for the satellite, terrestrial, and wireless communications industry.

Ultimateast
St. John's, Newfoundland
Name changed to Stratos Global Corp.
(see Stratos Global Corp.)

Vadeko International Inc.
Mississauga, Ontario
Formed in 1981 and specialized in robotics and various space-related technologies as well as thin-film technologies for anti-counterfeiting. Merged with AGRA Industries in 1987.

VISTAR Telecommunications Inc.
Ottawa, Ontario • 85 Employees
Provides wireless packet and data services.

Warden Systems
North Battleford, Saskatchewan
• 3 Employees
Designs and installs instrumentation for monitoring bulk storage systems (e.g. fluid levels in the oil industry).

Wavecom Electronics
Saskatoon, Saskatchewan
• 200 Employees
Designs, manufactures and distributes modulation systems for cable applications.